

**A NEW SPECIES BELONGING TO THE
VAEJOVIS PUNCTIPALPI GROUP
(SCORPIONES, VAEJOVIDAE) FROM
SOUTHERN MEXICO**

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ABSTRACT. A new species, *Vaejovis atenango*, belonging to the *V. punctipalpi* group is described from southern Mexico; this group was previously only known from the North American deserts in the USA and northern Mexico. This geographically discontinuous distribution is similar to that observed in the scorpion genus *Hadrurus* Thorell 1876 (Scorpiones, Iuridae).

RESUMEN. Se describe una nueva especie, *Vaejovis atenango*, del grupo *V. punctipalpi* del sur de México; este grupo solo se conocía de los desiertos de Norte América en los EE.UU. y el norte de México. Esta distribución geográfica discontinua es similar a la del género de alacranes *Hadrurus* Thorell 1876 (Scorpiones, Iuridae).

Keywords: Scorpion, taxonomy, Mexico, Guerrero, Morelos

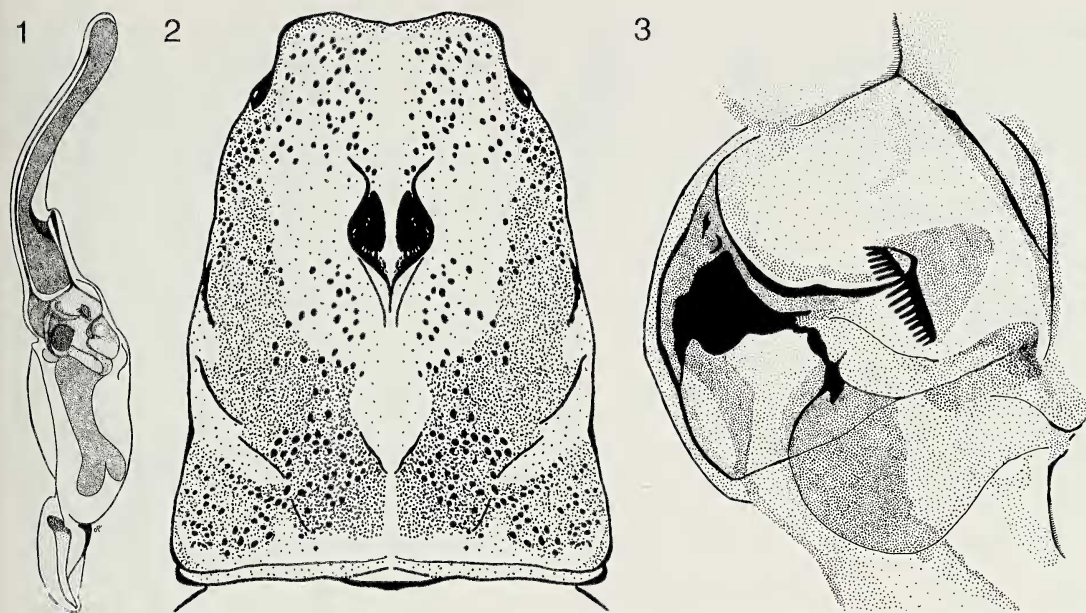
In August 2000 we were invited to attend a field trip to explore Cerro de la Víbora, Municipio de Atenango del Río, Guerrero (~18°14'N, 99°8'W) in southern Mexico. The land rises to 1320m among lowland valleys, was originally covered with low deciduous scrub forest, and it averages slightly less than 1000 m elevation in mostly karstic limestone formations. While black-lighting at night, we made an unexpected discovery: an unusual scorpion, which we immediately recognized as a member of the *Vaejovis punctipalpi* group. This species group contains nine species found in the North American deserts (Sisom 2000): six species in the Sonoran Desert; and two species in the Chihuahuan Desert. Thus, the geographical discontinuity presented by the new species is deemed significant.

The *Vaejovis punctipalpi* group was extensively characterized by Williams (1971). Among its diagnostic features are: (1) carapace with anterior margin essentially straight,

and its surface coarsely granular; (2) tergites densely granular, III–VI tricostate (the lateral keels vestigial on some members); (3) sternite VII with one pair of keels (ventral submedian keels obsolete); (4) dorsolateral and lateral subpramedian keels on metasomal segments I–IV strongly developed, serrate to crenulate, terminating in an enlarged spine posteriorly; (5) ventrolateral keels strongly developed and crenulate on all metasomal segments; (6) ventral submedian keels usually crenulate on segments II–IV; (7) metasomal segment V longer than movable finger on pedipalps; (8) female genital operculi fused; (9) pedipalp chela swollen, with granular keels; (10) pedipalp fingers short (fixed finger distinctly shorter than carapace), with tips reddish or brown in color; (11) chela trichobothria *ib-it* located near the sixth inner accessory granule; and (12) metasomal segments II–IV distinctly longer than wide (I usually longer than wide, or subequal in males, slightly wider than long in females).

Terminology and methods follow Ponce Saavedra & Sissom (2004). The specimens are deposited in the Colección Nacional de Arácnidos (CNAN), Instituto de Biología, Univer-

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Figures 1–3.—Morphology of the holotype male of *Vaejovis atenango* new species: 1. Lateral view of the left hemispermatophore; 2. Dorsal view of carapace; 3. Lateral view of the ental process of the inner capsular lobe, showing 15 hooklets in the “crown.”

sidad Nacional Autónoma de México (IBUNAM).

TAXONOMY

Family Vaejovidae Thorell 1876
Genus *Vaejovis* C.L. Koch 1836

Vaejovis C.L. Koch 1836:51; Sissom 2000:529 (full synonymy).

Type species.—*Vaejovis mexicanus* C.L. Koch 1836 by monotypy.

Remarks.—According to Sissom (2000), *Vaejovis* is the largest genus of North American scorpions with approximately 70 species, but it is not monophyletic. It is currently divided into five species groups (see Sissom 2000) which in turn may or may not be monophyletic, plus a number of “unplaced” species. A major systematic revision of the family Vaejovidae is needed, utilizing cladistic arguments, to sort out monophyletic groups and their phylogenetic relationships.

Vaejovis atenango new species
(Figs. 1–6)

Type material.—MEXICO: *Guerrero*: Adult male holotype, 15 km N of Atenango del Río, Municipio Atenango del Río, 18°07.548'N, 99°05.393'W, 651 m, 17 August 2000, M.

Capes, O. Delgado, O. Francke, and E. González (CNAN-IBUNAM). Paratypes: MEXICO: *Guerrero*: 1 adult female, 2 adult males, 3 juvenile females, and 10 juvenile male, collected with holotype (CNAN-IBUNAM); 1 adult male, Mirador del Río Balsas, 17°55.082'N, 99°20.085'W, 25 August 2002, Y. Gadar (CNAN-IBUNAM); 1 adult female, La Cubetera, Municipio Valerio Trujano, 21 June 1964, no collector (CNAN-IBUNAM); *Morelos*: 1 adult male, Unidad Progreso, Jiutepec, 18°52.800'N, 99°90.000'W, 1330 m, 2 August 2003, M. Córdova, A. Jaimes and A. Villalba (CNAN-IBUNAM); 1 juv., Colonia Miraflores, Jiutepec, 18°52.800'N, 99°90.000'W, 1330 m, 26 June 2005, M. Córdova (CNAN-IBUNAM). 1 adult male, Cerro la Quebradora, Cañón de Lobos, Carretera Jiutepec-Cuautla, Municipio Jiutepec, 18°50.400'N, 99°8.400'W, 11 August 2004, M. Córdova (CNAN-IBUNAM);

Etymology.—The specific name is a noun in apposition taken from the type locality, Atenango del Río, Guerrero, Mexico.

Diagnosis.—The new species is a member of the *V. punctipalpi* group as diagnosed above, which can be separated from the other species of *Vaejovis* in this group by the following combination of characters. Adult males with moderate scalloping in the pedi-



Figures 4–6.—Morphology of the holotype male of *Vaejovis atenango*: 4. Lateral view of metasomal segments IV–V and telson; 5. Dorsal view of right pedipalp chela; 6. External view of right pedipalp chela.

palp chela fingers, leaving a distinct gap when fingers closed; females without scalloping or gap. Pedipalp chela with carinae weak to vestigial, developed as broad, low granular ridges rather than sharp keels. Fixed finger with median denticle row divided into 5 subrows by 4 enlarged denticles. Ventral submedian carinae on metasomal segments I–II weak to vestigial, smooth; on III–IV weak, smooth basally and finely serrate distally. Hemispermatophore inner capsular lobe with “crown” of 15 spines

or hooklets, median lobe with sclerotized apophyses.

Description.—*Holotype male*: *Coloration (in alcohol)*: Base color of the pedipalps, chelicerae, legs and metasoma yellowish; mesosoma with faint dusky longitudinal stripes on tergites; fingers of the pedipalp chelae yellowish orange. Aculeus reddish.

Prosoma: Carapace longer than wide (Fig. 1); ratio of carapace length/metasomal segment V length 0.8. Anterior margin weakly

bilobed. Median ocular tubercle slightly raised above carapacial surface. Carapace densely, coarsely granular. Frontal margin of carapace with three pairs of setae.

Mesosoma: Median tergal carina on I and II weak and smooth, on III–VI moderately developed, smooth to crenulate; lateral keels vestigial, represented by a few granules interspersed on a densely granular surface, highlighted by dusky markings. Tergites covered densely with fine granulation on central two-thirds, sides coarsely granulate. Pectinal tooth count 17–18. Sternites III–VII densely punctate. Sternite VII finely granulate, with one pair of moderately strong, crenate lateral carinae.

Hemispermatothore: Distal lamina approximately 15% longer than trunk. Broad flange present forming with distal lamina a distinctive round notch. Ental process of the inner capsular lobe (sperm plug *sensu* Sissom & Stockwell 1991) with “crown” of 15 spines or hooklets. Median lobe with sclerotized apophyses (Figs. 2–3).

Metasoma: Segment I as long as wide; III length/width 1.4; V length/width 2.8. Dorsolateral and lateral supramedian carinae on segments I–IV strong, with large, serrate irregular denticles; distal denticle moderate, not pointed. Lateral inframedian carinae on I complete, strong, crenate-serrate; on II present on distal 1/4 only, strong, serrate; on III weak, present as few granules distally; on IV absent. Ventrolateral carinae on I–IV strong, serrate-crenulate. Ventral submedian carinae on I vestigial, smooth; on II vestigial and smooth basally, weak and faintly serrate on distal third; on III weak, smooth basally, serrate on distal half; on IV moderately strong, crenulate to serrate. Segment V (Fig. 4): dorsolateral carinae strong, granular, serrate on distal third; lateromedian carinae strong, serrate on basal half, then weakening to disappear in distal third; ventrolateral and ventromedian carinae strong, serrate. Metasomal carinae setation: I–IV dorsolateral 1:2:3:3, lateral supramedian 0:2:2:4, lateral inframedian 1:0:0:0, ventrolateral 2:2:2:3–2, ventral submedian 3:3:3:3; segment V, dorsolateral 6, lateral 3/4, ventrolateral 7, ventromedian 5/4. *Telson*: Aculeus represents 1/4 total length; ventral surface with 11 pairs of regular setae, not covered with long fine hairs.

Pedipalps: Femur: length/width ratio 3.1;

tetracarinate, dorsointernal, dorsoexternal and ventrointernal carinae strong, granular, ventroexternal carina vestigial, with few moderate granules basally. Internal face with 5–7 subconical granules. Ventral and dorsal surfaces covered densely with fine granules and scattered moderate granules. Orthobothriotaxia C.

Patella: length/width ratio 2.9; tetracarinate, dorsointernal and ventrointernal carinae strong, granular, dorsoexternal and ventroexternal carinae moderate, crenulate. Internal face with 4–5 subconical granules arranged in a longitudinal row. All surfaces densely covered with fine granules. Orthobothriotaxia C.

Chela (Figs. 5–6): Length/width ratio 3.3. Ratio fixed finger length/carapace length 0.6. Dorsal marginal, dorsal secondary, digital and ventrointernal carinae present as rounded ridges covered with fine granulation; dorsointernal carinae as a prominent ridge covered with fine granulation and a few moderate granules; external secondary, ventromedian, ventrointernal carinae present as rounded ridges covered with fine granulation. Dentate margin of fixed finger with primary row divided into five subrows by four enlarged denticles; six inner accessory denticles. Dentate margin of movable finger with primary row divided into seven subrows; apical subrow consisting of a single denticle; seven inner accessory granules, the distal one paired with single apical subrow denticle. Dentate margin of fingers with moderate scalloping; leaving a distinct gap when fingers closed. Orthobothriotaxia C.

Legs: Ventromedian spinule row of telotarsus distally with four prolateral and three retrolateral enlarged spinules flanking the main spinule row.

Measurements of holotype (mm): Total L 53.1; carapace L 6.1; mesosoma L 13.9; metasoma L 25.7; segments: I L/W 3.4/3.4; II L/W 4.1/3.4 III L/W 4.4/3.2; IV L/W 5.8/3.1; V L/W 8/2.9. Telson L 7.4; vesicle L/W/D 4.9/3.2/1.9; aculeus L 2.5; Pedipalps: femur L/W 5.3/1.7; patella L/W 5.8/2.0; chela L/W/D 9.5/2.9/3.1; fixed finger L 3.9; movable finger L 5.4; palm L 4.1.

Measurements of paratype female: Total L 56.6; carapace L 7; mesosoma L 16; metasoma L 34; segments: I L/W 3.4/3.6; II L/W 3.9/3.6; III L/W 4.4/3.4; VI L/W 5.9/3.2; V L/W 8.3/3.2. Telson L 7.6; vesicle L/W/D 5.1/2.9/2.2; aculeus L 2.7; Pedipalps: femur L/W 5.6/2; patella L/W 6.5/2.8; chela L/W/D 10.7/

3.2/3; fixed finger L 4.4; movable finger L 6.1; palm L 4.6.

Intraspecific variability.—In adult females the pedipalp chela fingers lack scalloping and there is no gap when the fingers are closed.

Among 16 males examined, pectinal tooth counts varied as follows: four combs with 16 teeth, 10 combs with 17 teeth, 17 combs with 18 teeth (= mode), and one comb with 19 teeth. Among the six females, we observed two combs with 13 teeth, four combs with 14 teeth and four combs with 15 teeth.

At the type locality, males of this species mature at two different instars, as indicated by their relative sizes: sexually mature males, confirmed by the presence of hemispermatophores, have carapace lengths of 6.1 mm (adult instar = A), 5.1 mm (A-1) and 4.6 mm (A-1), respectively; and there are also sexually immature males at 4.7 mm and 4.5 mm (A-1), respectively, which with a growth factor of 1.3 per molt would attain the size of the sexually mature holotype (Francke & Sissom 1984). Female sample sizes are insufficient for a similar analysis regarding age and size at maturity.

Comparisons.—The *Vaejovis punctipalpi* group as presently recognized has nine species (Sissom 2000). Six species lack scalloping in the pedipalp chela fingers, and the fingers close completely without an apparent gap (*Vaejovis bruneus* Williams 1970, *Vaejovis cazieri* Williams 1968, *Vaejovis crassimanus* Pocock 1898, *Vaejovis hirsuticauda* Banks 1910, *Vaejovis insularis* Williams 1971 and *Vaejovis sonorae* Williams 1971); one species has pronounced scalloping in both males and females, and a large gap is apparent when the fingers are closed [*Vaejovis punctipalpi* (Wood 1863)]; and only two species are similar to *V. atenango* in that males have moderate to weak scalloping and a distinct gap, whereas females lack scalloping and a gap (*Vaejovis magdalensis* Williams 1971 and *Vaejovis russelli* Williams 1971). The fixed finger of *V. magdalensis* has 5 median enlarged granules dividing the median denticle row into six subrows, as opposed to four enlarged granules and five subrows in *V. atenango*. Both *V. magdalensis* and *V. russelli* have moderately to strongly developed granular keels on the pedipalp chela; whereas *V.*

atenango has them weakly developed, rounded, and weakly granular.

In Hoffmann's (1931) key to the Mexican species of *Vaejovis*, the new species belongs in the "second section": species with ventral submedian keels present on all metasomal segments, which are smooth on the first three segments. *Vaejovis atenango* differs from *V. intrepidus* Thorell 1876, including its three subspecies, in being smaller in size, lighter in base color, lacking strong granular keels on the pedipalp chelae, and in having only four enlarged denticles on the median row of the fixed finger instead of five. *Vaejovis occidentalis* Hoffmann 1931 also has five enlarged granules on the median denticle row of the fixed finger; metasomal segments I–III wider than long; and seven spines on the hemispermatophore capsular "crown"; whereas *V. atenango* has only four such denticles, metasomal segments II and III distinctly longer than wide, and 15 spines in the hemispermatophore capsular crown. In *V. subcristatus* Pocock 1898, the ventral submedian carinae on metasomal segments I–IV are vestigial and smooth; whereas on *V. atenango* they are weak, smooth on I and II, finely serrate on the distal half of III and IV; in *V. subcristatus* the ventrolateral keels on metasomal segments I–IV are weak and smooth, whereas on *V. atenango* they are moderately strong and finely serrate on all segments; finally, the hemispermatophore capsule in *V. subcristatus* has a crown of only 7–8 spines (Sissom 1989).

Biogeographic considerations.—An interesting parallelism exists between the disjunct distribution of members of the *V. punctipalpi* group, and the distribution of the genus *Hadrurus* Thorell 1876 (family Iuridae Thorell 1876), which has four species mostly in the Baja California Peninsula (one species ranges north across the border into the USA), two species largely in the southwestern USA (one species ranges south across the Mexican border into Sonora), one species in Oaxaca and Puebla, and one species in Guerrero (Sissom & Fet 2000). The last one, *Hadrurus gertschi* Soleglad 1976, was also collected around the foothills of Cerro de la Vfbora, Municipio de Atenango del Río, on the same field trip where the new species was found. Therefore, we hypothesize that the same vicariance event, most likely related to the splitting-off of the Baja California Peninsula from the Mexican main-

land, resulted in the discontinuous distributions discussed above.

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